

# Gunnery Department MLRS Division

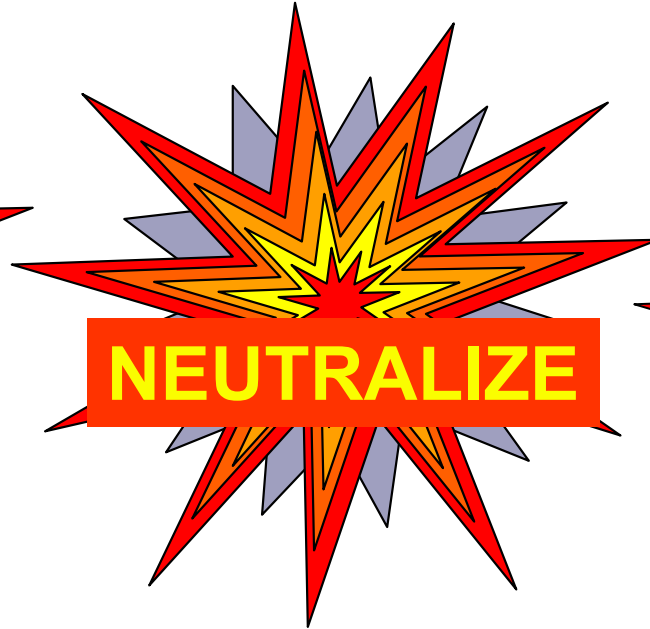
*“Standards Start Here”*



# *Field Artillery Captain's Career Course*

## *MLRS DELIVERY OF FIRES*

# ***The Mission of the Field Artillery is to...***



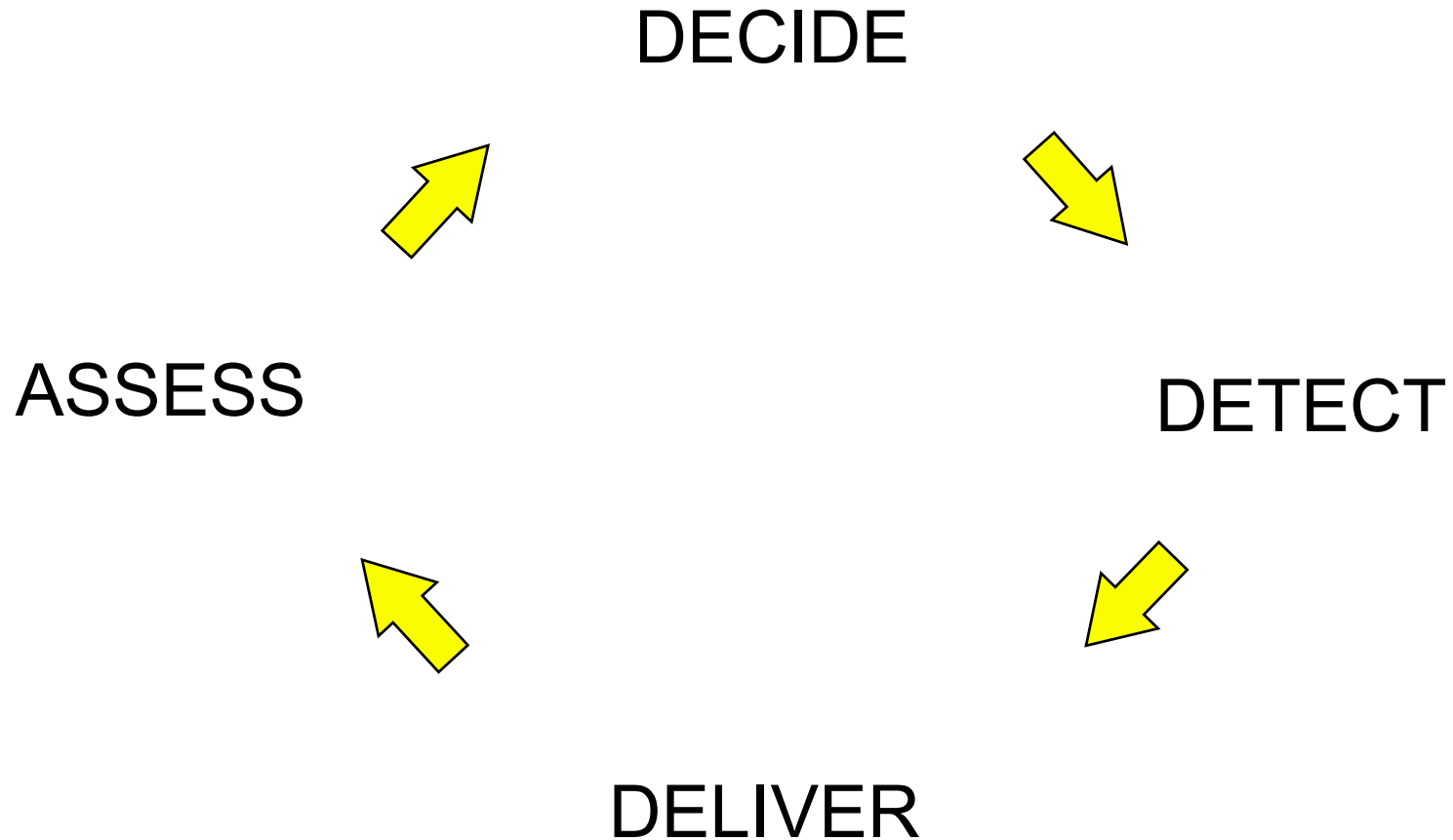
the enemy by cannon, **ROCKET** and **MISSILE** fire  
and to help integrate all fire support assets into  
combined arms operations.

# ***Learning Activities***

- Identify the MLRS Targeting Process
- Identify the Levels of Intensity
- Identify requirements in determining Launcher Location
- Identify Tactical Response Posture methods
- Demonstrate knowledge in Meteorological Requirements
- Identify requirements in Fire Mission Processing
- Determine MLRS Safety Procedures

# *Targeting Process*

# ***D3A Targeting Methodology***



# ***Decide***

- Overall focus/sets intell collection priorities.
- What delivery system to use.
  - Avail of other wpns sys (manned aircraft)
  - Range to target (munitions availability)
- Which targets to attack (TSS,HPTL,AGM).

# ***Detect***

- What to look for (PIR)
- Where to look (NAI)
- What to look with (TA)
- Where to attack (TAI)



# ***Deliver***

- Which weapon system
- Determine desired effects.

Destroy!  
Neutralize!  
Suppress!

# Assess

Final verification of target.

# ***Control of Munitions***

*(M39)*

- Centralized
- Decentralized

# ***Control of Munitions***

## ***Centralized***

- M39 Army Tactical Missiles (ATACMS)
- Normally fired at stationary targets beyond Division's AO
- Generally fired by corps MLRS BNs
- Controlled by the Corps Artillery

# Centralized Execution

## Suite of Sensors

JSTARS	UAV
Radar	SOF
LRS-D	ELINT

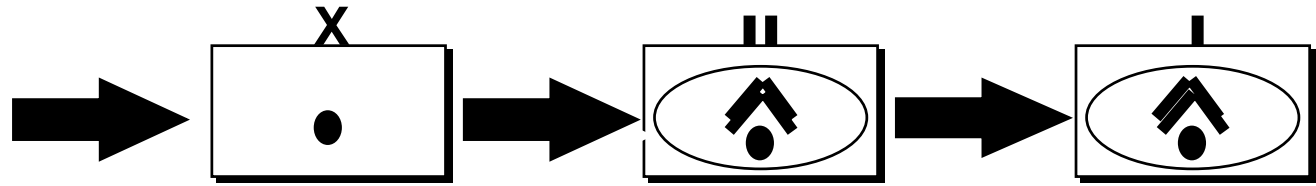
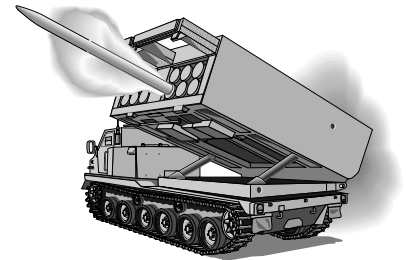
GSM 2



XXX

CTOC

Targeting Team	
AVN	ASOC
ADA	FSE

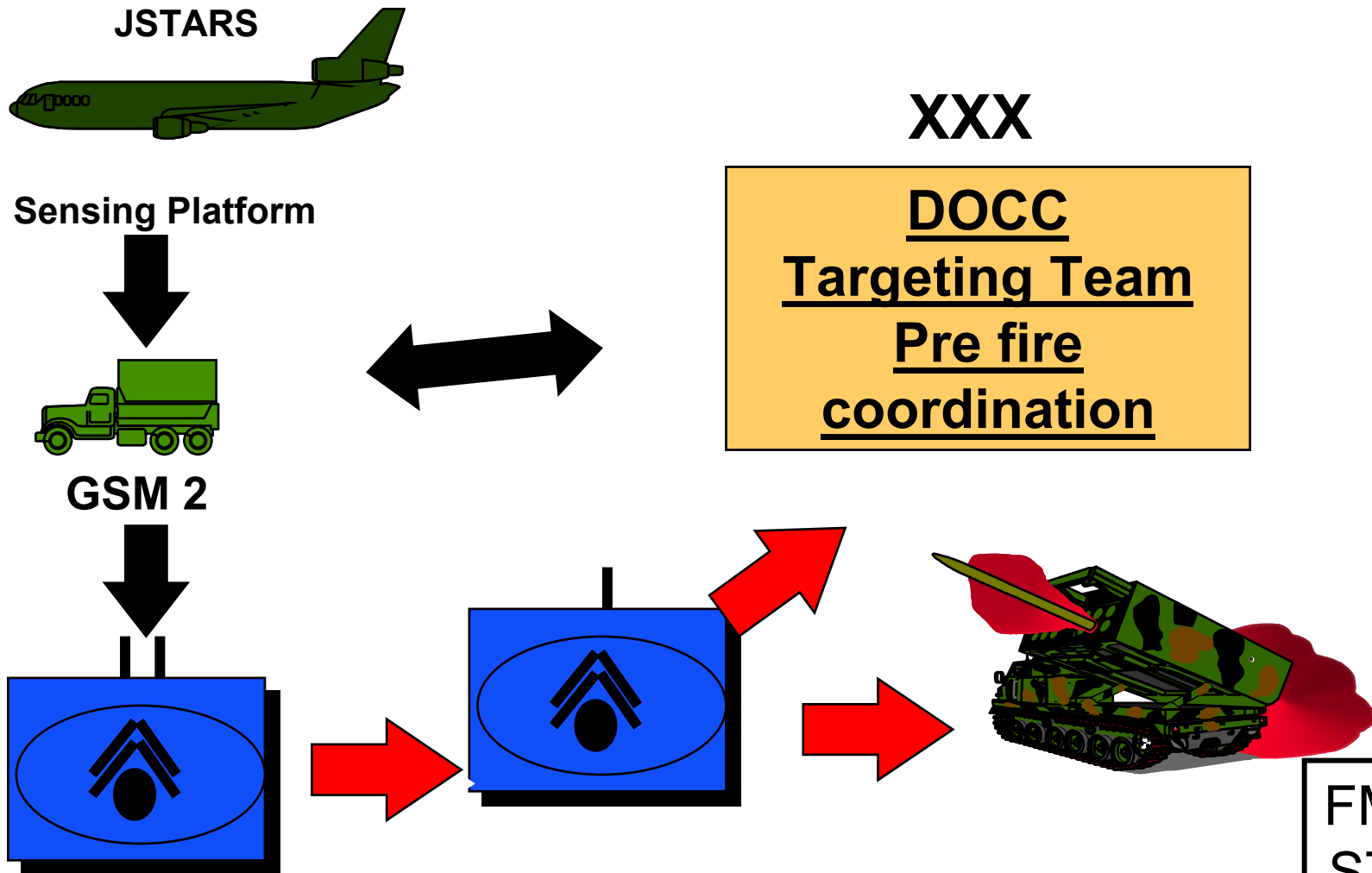


# ***Control of Munitions***

## ***De-Centralized***

- CGS attaches to MLRS BN
- Time-sensitive HPTs
- TTP uses amended AMC Fire Mission
- Rehearse, rehearse, rehearse

# ***Decentralized Execution***



FM 6-20-10  
ST 6-60-30  
FM 3-09.60

*Launcher  
Location*



# ***Launcher Location***

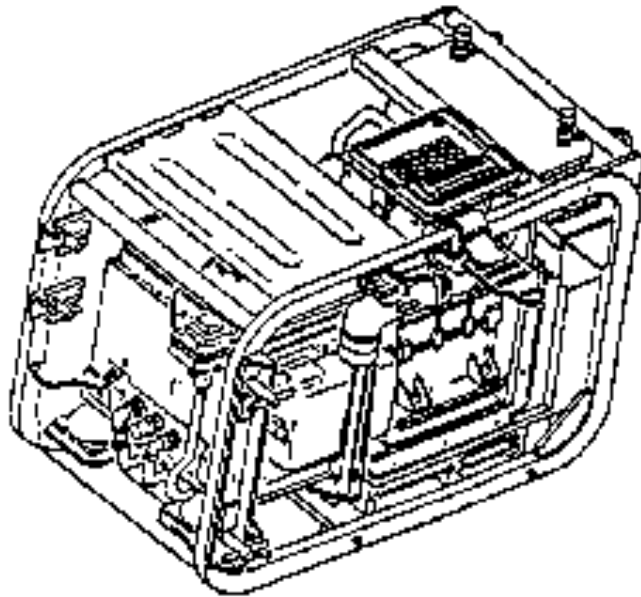
- PDS Update
- SRP Alignment
- Calibration

# ***PDS Update***

- Maintain Accuracy
- Normally done after 6 to 8 km of travel.
- PDS output compared to known survey control point (SCP)
- Calibration constants are not changed

# ***PDS Update***

## ***Position and Determining System (PADS)***



- One PADS per battery
- Determines location and altitude
- Primary means for determining position control
- Survey section controlled through the BOC

# ***PDS Update***

## ***Precision Lightweight GPS Receiver (PLGR)***



- One PLGR per launcher section
- Secondary means for establishing position control
- Only useful for position control when SPLL is updated at the FP

# ***SRP Alignment***

- Orientation of gyro-compass determines
  - Heading
  - Elevation
  - Slope
- Initial uncompensated alignment takes 8 minutes
- Additional stabilization results in a compensated SRP (about 2.5 minutes)

# ***SRP Realignment***

- Countdown clock alerts crew when to realign the SRP
- Realignment takes 3.5 minutes Launcher stationary; LLM stowed
  - Compensated Realignment

# ***Time Between SRP Realignments***

## M26 Rocket

UNCOMPENSATED

15:00

COMPENSATED

60:00

## M39 Missile

UNCOMPENSATED

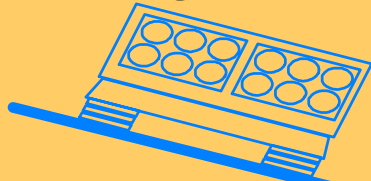
11:00

COMPENSATED

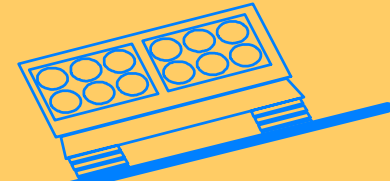
28:00

# ***SPLL Slope***

**Positive Roll Angle  
Left Side is Higher**

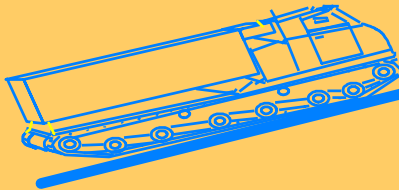


**Negative Roll Angle  
Left Side is Lower**

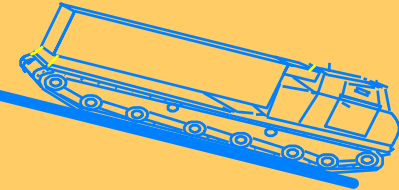


## ***ROLL & PITCH***

**Positive Pitch  
Front is Higher**



**Negative Pitch  
Front is Lower**



The combined Roll and Pitch Angle should not exceed the carriers limitations of 89 mills or 5 degrees. The system will accept up to 266.7 mills before telling you "Slope to great move vehicle".



# ***PDS Calibration***

- PDS calibration compares the PDS output against two known SCP locations and computes calibration constants
- The constants are then used as the odometer scale factor, azimuth crab angle, and elevation crab angle calibration parameters until the next calibration

# ***PDS Calibration***

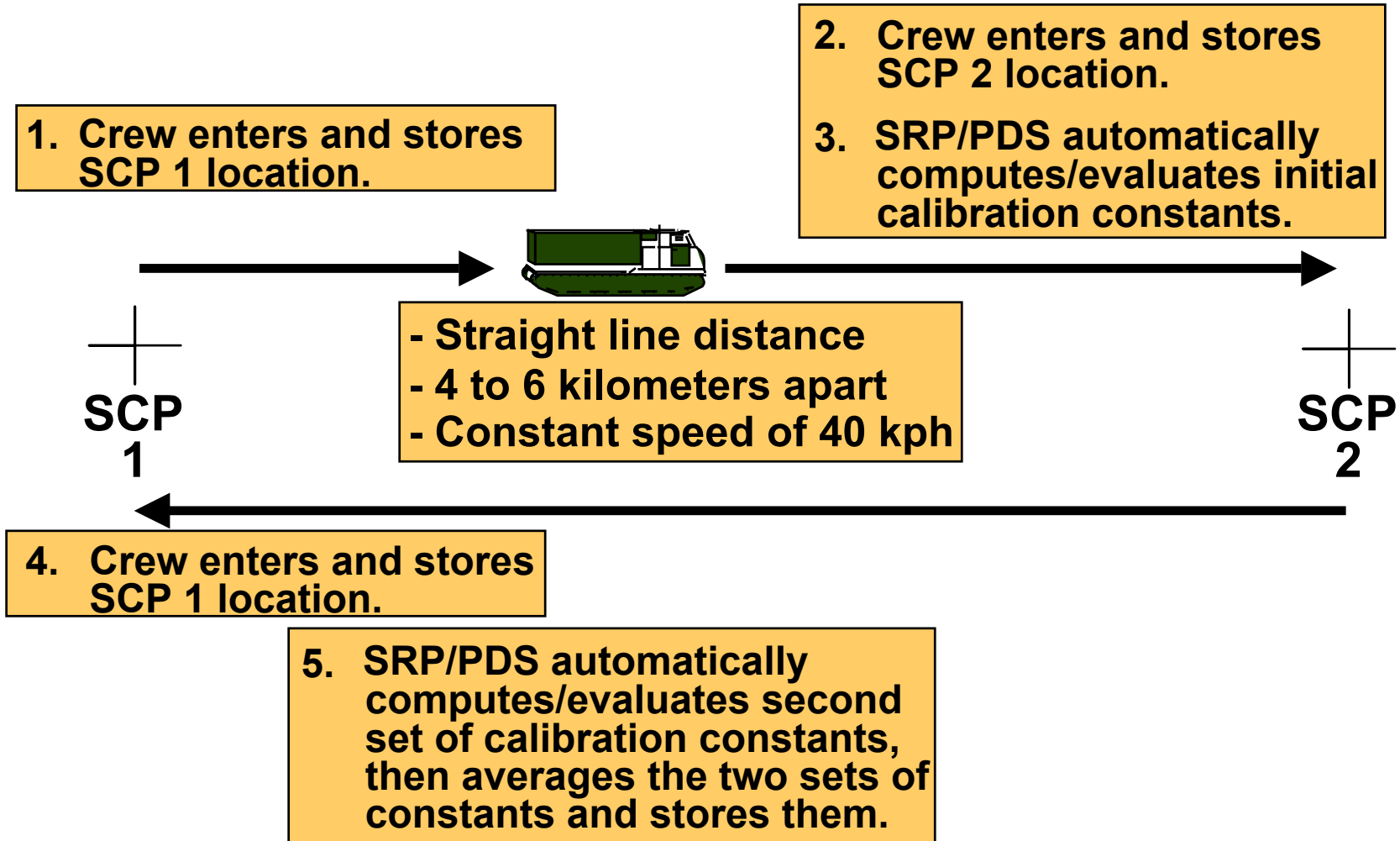
- Corrects for errors caused by:
  - Differences in track tension
  - By wear of sprockets and track components
- How often?
  - Every 30 Days
  - After SRP/PDS Replacement
  - After major suspension or track drive system maintenance
  - When operating conditions change

# ***PDS Calibration***

Required:

- Two SCPs 4-6 KM apart in a straight line distance.
- You should drive the launcher between the two points at a constant speed of 40KPH

# Calibration



*Tactical  
Response  
Posture*

# ***Weapon Information***

- Indicates launchers' readiness to respond to fire missions
  - Directed by Commander
  - Posturing HOT, COOL, or COLD

\* See Table 6-1 (P 6-7) for MFOM and AFOM J-codes

# ***Hot Status***

- Launcher is fully capable of firing a mission
- Response time 2-6 min depending on:
  - Travel time to Firing Point
  - Launcher lay time (93 Sec for M270)

# ***Cool Status***

- Launcher can fire after SRP alignment
- Response time 12-20 min
- Used for temporary break in firing
  - Minor PMCS
  - Class I
  - Refueling



# ***Cold Status***

- Launcher is Non-mission capable for:
  - Maintenance
  - PMCS
  - Crew rest
- Response time is a minimum of 30 min

# *Meteorological Requirements*

## ***Accurate MET***

- Launcher FCS uses all lines to compute firing data
- MET message received from Force FA HQs to Bn to Btry to the Launcher
- FDS can interface directly with MDS (heavy divisions ) or MMS (light divisions)

# *Criteria*

- Current MET from station within 20 km of Firing Points
- Current MET from nearest station outside of 20 km from Firing Points
- MET over 2 hours, but from station within 20 km of the Firing Points
- **Note:** 4 hour MET can be used except during transitions

# ***Message Heading***

- Verify if date and time are current
- Note: GMT is used
- Check met station height
- Identification line and line 00 pressure should be the same

Indicates a  
Computer  
MET

The station  
altitude in tens  
of meters

Atmospheric  
Pressure  
in Millibars

COMPUTER MET MESSAGE									
For use of this form, see FM 6-15; the proponent agency is TRADOC									
IDENTIFICATION	OCTANT	LOCATION			DATE	TIME (GMT)	DURATION (HOURS)	STATION HEIGHT (10's M)	MDP PRESSURE MB
METCM	Q	L <sub>a</sub> L <sub>a</sub> L <sub>a</sub>	L <sub>o</sub> L <sub>o</sub> L <sub>o</sub>		G <sub>o</sub> G <sub>o</sub> G <sub>o</sub>	H	hhh	P <sub>d</sub> P <sub>d</sub> P <sub>d</sub>	
		or xxx	or xxx	YY					
METCM	1	347	984	25	138	4	036	974	

Global  
Position where  
the MET was  
taken

Position of MET  
Station in LAT and  
LONG to the  
nearest 10th of a  
degree

Day of the  
Month/Greenwich

A one digit code representing  
the duration the MET is valid  
for

Greenwich Mean Time: The 1st  
two digits represent the hour, and  
the 3rd digit represents the minutes  
in tenths

# ***Message Body***

Question MET when lines change:

- Greater than 1000 mils in wind direction
  - Greater than 10-15 knots in wind speed
  - Greater than 20 Kelvin in temperature
- and:
- Atmospheric Pressure does not decrease consistently

# *Fire Mission Processing*



# ***Computational Procedures***

- Tactical fire direction computed via the FDS
- Technical fire direction computed via the FCS on the launcher
  - Computes firing data for all fire missions
  - The EU munitions programs are input from a cassette through a PLU

# ***Battalion FDC***

- Tactically controls fires of the battalion
- NCS for the Fire Direction Net(s)
- Primary link with Force FA HQ
- Receives fire plans from Force FA HQ
- Checks for FSCM violations
- Selects platoon to execute fire mission
- Transmits targets to battery FDCs

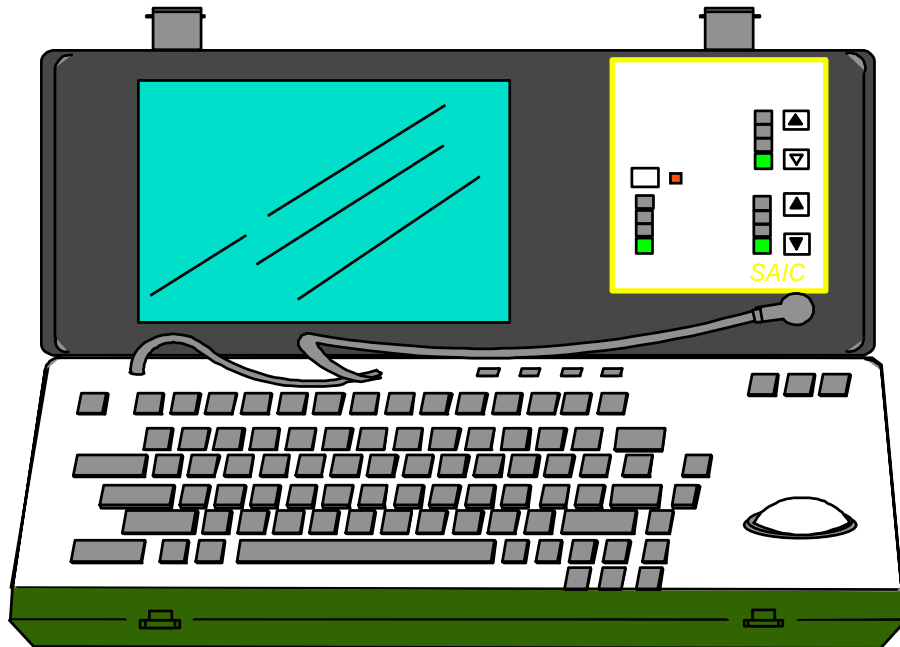
# ***Battery FDC***

- Concerned solely with delivery of fires
- Executes fireplans
- Checks for FSCM violations
- Transmits fire mission to launcher
- Maintains status of launchers

# ***Platoon FDC***

- Monitors all traffic between BOC and launchers
- Relays messages and orders
- Maintains ammunition and launcher status
- Be prepared to assume Jump BOC

# ***Fire Direction System (FDS)***



(AN/GYK-37)

# ***FDS Capabilities***

- Stores and executes up to 6 fire plans
- Same program hard drive at:
  - Battalion
  - Battery
  - Platoon
- Selects number of aim points
- Selects number of rockets

# ***Target Processing***

## Target Type

- Volleys Type Targets
- Effects Type Targets

# ***Volleys Type Target***

- All rockets aimed at target center
- If no entry, default value is six rockets



# *Effects Type Targets*

- FDS selects number of rockets to fire at a specific number of aim points (maximum of 6 per target)
- Aim point determining criteria:
  - Desired effects
  - Target size
  - Range to target

# ***Effects Cut-off Factor (ECOF)***

- Specifies the minimum percentage of effects that the commander considers acceptable on a fire mission:
  - FDS begins with one round
  - It then adds one round at a time comparing the effects each time
  - When an additional round does not increase the effects by ECOF, effects processing is terminated

# ***Launcher Response***

- Launcher receives fire mission
- Launcher FCS verifies
- Mission can be fired after consistency check
- Launcher has correct type and amount of munitions
- Target is within range
- Sends “WILCO” message to battery

# ***Movement to Firing Point***

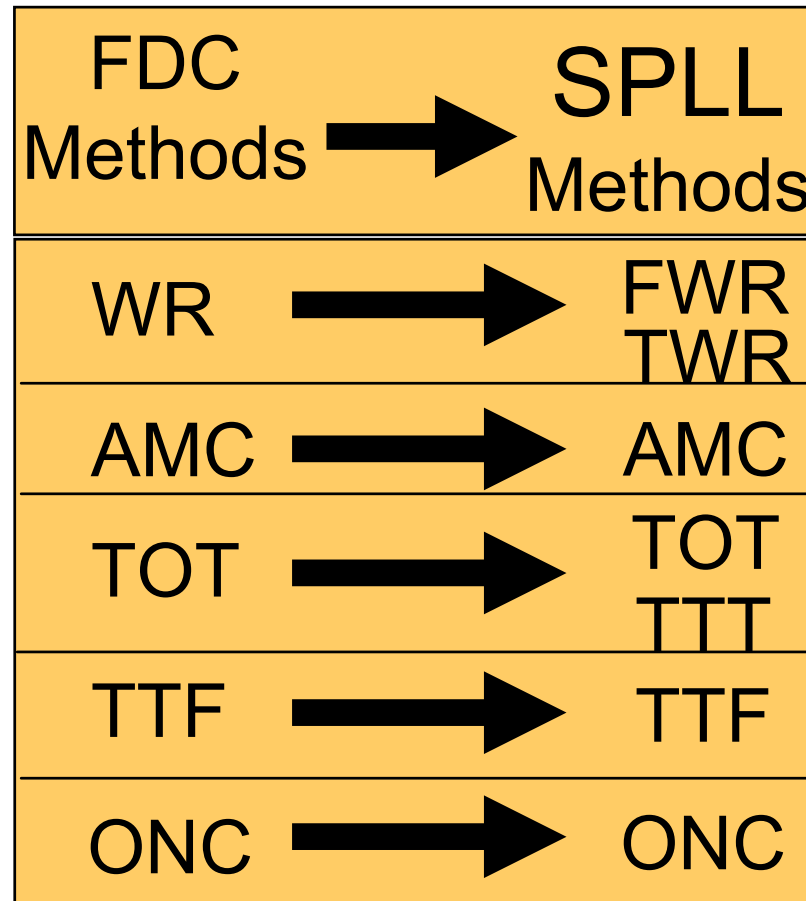
- Launcher moves to Firing Point
- Verifies no immediate masks present
- Orients on parking heading within 100 mls
- Position SPL within 150m of FP
- Lays launcher, arms munitions, **FIRES!**
- Stows LLM
- Moves to next location

# ***Multiple FM Sequence***

## ***Resource Limitations***

- Number of targets excessive
- Limited launcher availability
- Crew can fire up to three missions
  - BOC assigns two targets to same FP
  - FCS recognizes multiple Fire Missions
  - Launcher automatically lays on second target, crew will ARM/FIRE rockets IAW specified method of control

# ***Methods of Control***



# ***Initial Fire Mission Processing***

- Sufficient Weapons (Rocket availability)
- Field/subfield consistency
- Estimate range to target
- Compute park headings
- Stores time between rounds
- Estimates time of flight

# ***Weapon Malfunctions***

<b>D</b>	Dud Fuze
<b>M</b>	Misfire
<b>P</b>	PIM Related Failure
<b>W</b>	Weapon Related Malfunction
<b>H</b>	HANGFIRE



# *Hangfire*

- HANGFIRE light flashes
- “H” appears in status line
  - Crew ensures cab is safe/sealed
  - Crew waits for 30 minutes
  - Gunner sets ARM switch to safe
  - Gunner Stows LLM
  - Move to unloading site

*Safety*

# ***Safety***

- Responsibilities
- Procedures
- Downrange Masks

# ***Responsibilities***

- Range Safety Officer
- Commander
- Officer in Charge (OIC)
- Operations Officer
- Platoon Leader
- Section Chief

# ***Computation of Safety Data***

- Safety Computation Methods
  - OPAREA
  - Firing Point
  - Point to Point
- Down Range Masks
- Airspace Coordination

# ***Bias and Precision Errors***

Bias errors affect all rockets of a mission and are “occasion to occasion” errors

- Examples: errors in measurement of wind speed or direction, errors in measurement of air density.

Precision errors are caused by variations between rockets and differ for each rocket

- Examples include: Variation in launch weight, variation in rocket motor total impulse.

## ***Down Range Masks***

- Masks are terrain features that have enough altitude to potentially affect trajectory of rocket or missile.
- Immediate Mask: 2000 m from firing point.
  - Section Chiefs' responsibility
- Down Range Mask: Greater than 2000 m from firing point.
  - Ops Officer / Plt Ldr's responsibility

# ***Accounting for Masks***

- Immediate Masks:
  - Use M2 compass and enter in FCS.
- Down Range Masks:
  - Use Crest Clearance Tables (App “ H”)
  - Use automated checks in LCU



# ***Crest Clearance Tables***

- Allows leaders to establish minimum planning range
- Boxes of area that cannot be attacked beyond crest

# ***Automated Down Range Mask***

- Entered in the FDS as 3D boxes around terrain feature
- FDS uses input to determine tactical fire direction solution
- Consideration is loss of some area to fire through

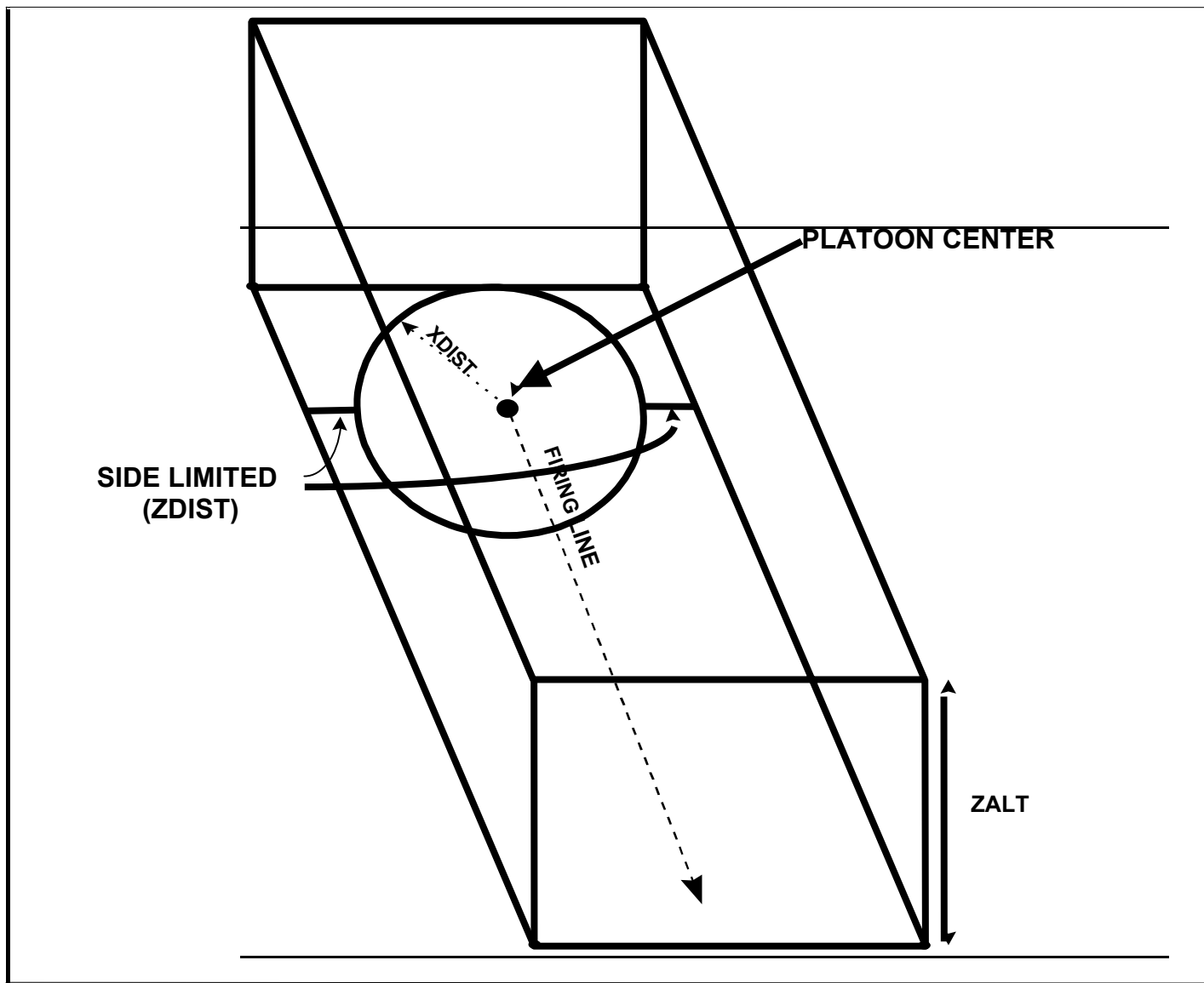
# ***Air Space Coordination***

## ***(Restricted Operating Zone)***

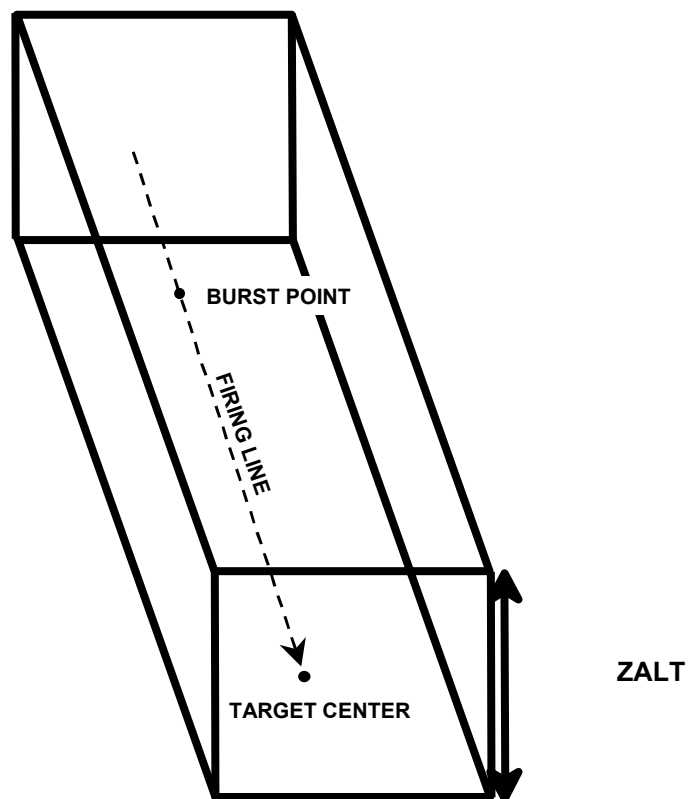
- Platoon Air Hazard (PAH)
- Target Air Hazard (TAH)

Another reason why accurate launcher location is important!

# ***Platoon Air Hazard (PAH)***



# ***Target Air Hazard (TAH)***



BLOCK 1A ONLY

# ***Summary***

- Targeting Process
- Levels of Intensity
- Launcher Location
- Tactical Response Posture
- Meteorological Requirements
- Fire Mission Processing
- MLRS Safety Procedures

# Gunnery Department MLRS Division

*“Standards Start Here”*

